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70-734

General Atomic Company
ATTN: Mr. W. R. Howry
Licensing Administrator
Quality Assurance and Compliance
Division
P.O. Box 81608
San Diego, California 92138

Gentlemen:

We have completed the initial review of the renewal application for License No. SNM-696, dated July 24, 1981, and its supplement dated March 16, 1982, and find additional information is needed to complete our evaluation.

The enclosure to this letter lists our comments and questions relating to your renewal application, all of which were discussed with your staff during our visit to your facility on June 14-18, 1982, and in subsequent telephone conversations with members of your staff.

Prior to submitting formal responses to our comments and questions, you may find it prudent to arrange a meeting to discuss a draft of your repponses. Formal responses are due no later than October 1, 1982.

If there are any questions concerning this matter, please call me.

Sincerely,

Original signed by
Norman Ketzlach

Norman Ketzlach
Uranium Process Licensing Section
Uranium Fuel Licensing Branch
Division of Fuel Cycle and
Material Safety, NMSS

Enclosure: As stated

OFFICE ▶	FCUP	FCUF	FCUP				
SURNAME ▶	NKetzlach/al	LTyson	WTCrow				
DATE ▶	7/3/82	8/2/82	8/2/82				

COMMENTS ON GENERAL ATOMIC COMPANY
RENEWAL APPLICATION
LICENSE NO. SNM-696, DOCKET 70-734

I. LICENSE CONDITIONS SECTIONS

1. Page II 2-1 Confirm the reactor fuel elements to be fabricated and/or assembled shall be only those related to fuels having conditions and fabricated by the processes described in the application.

2. Page II 3-1 State your policy and indicate the procedures by which the policy with regard to safety of the work place and implementation of all license requirements will be assured. It should also be the policy of all organizational components to keep radiation exposures to employees and the general public as low as is reasonably achievable (ALARA). Include the commitment to follow procedures.

3. Pages II 3-2 and -3

a. Confirm there is a manager of each function specified who is responsible for its operation and performance (include in Figure II, 3.1-1).

3.3.1.b Confirm that the facility manager shall be knowledgeable and responsible for implementing the licensee's radiation protection program.

3.2.2.3 Confirm that Licensing Administration shall review and approve all procedures and Work Authorizations which involve SNM.

b. Identify the responsible position for determining whether proposed changes in operations may be approved internally or whether a license amendment is required.

c. Confirm the Criticality and Radiation Safety Committee (CRSC) reviews and approves the Radiological Safety Guide and changes thereto in addition to its review and approval by the Manager of Health Physics.

d. Specify who conducts training programs in nuclear criticality safety.

e. Confirm you have a document control system that assures all operating procedures in the related work areas are maintained current. Describe the document control system in a demonstration section of the application.

f. Specify the responsibilities and minimum qualifications for the health physics technicians.

4. Page II 3-4 Section 3.2.4

a. Indicate the responsibilities and decision making functions of the CRSC.

b. Specify the organizational position responsible for the selection of CRSC members and its reporting location.

c. Specify the frequency of meetings, audits, membership, and reporting and recordkeeping requirements.

d. Confirm the audits are performed at least annually with no more than 13 months between audits or provide justification for an alternate periodicity to assure an annual audit. Provide the minimum distribution of audit reports. The president and/or executive vice president to whom the CRSC reports should be on the distribution list.

5. Pages II 3-4 and -5, Section 3.3.2

a. Expand the "applicable" experience of the Director Nuclear Materials Control Division (NMCD).

b. Confirm the 2 years' experience of the Manager, Health Physics, in radiation protection is in positions which demonstrate sufficient judgment and capability to establish and maintain an effective radiation safety program and ability to evaluate potential radiological hazards for the types of activities authorized by License SNM-696.

c. Confirm the Manager, Nuclear Safety, has at least two years' experience in outside-of-reactor nuclear criticality safety or two years' experience in nuclear reactor physics and one year's experience in outside-of-power reactor nuclear criticality safety. The experience in outside-of-power reactor nuclear criticality safety shall include the methods of analysis similar to those required for analyzing the types of activities authorized by License SNM-696. If someone other than the manager performs the analyses, his position should be included as a key position and the minimum qualifications specified. The second party independent reviewers of the analyses should also be identified as key positions with the same minimum qualifications (Section 3.3.4).

d. Clarify the type of "nuclear related activities" of the Manager, Licensing.

e. Clarify the "applicable experience" for the Manager, Nuclear Materials.

f. Clarify the specified "accredited" college degrees for all those listed.

6. Page II 3-6, 7

Confirm all required reviews, analyses, and approvals are documented.

7. Page II -7, Section 3.4

a. Confirm the managers in Health Physics, Nuclear Safety, Nuclear Materials Management, and Licensing approve the Work Authorization and/or change.

b. Confirm all approvals and authorizations are in writing.

c. Confirm the Work Authorization procedures apply to operating, maintenance, and test procedures and to changes in equipment or facilities of a safety-related nature.

d. Confirm all safety reviews are documented.

e. Confirm the approved procedures are available in the related work areas.

f. Specify the minimum frequency and responsibility for operating procedures review and updating. State your commitment to conduct fissile material processing only in accordance with properly issued written procedures.

8. Page II 3-8

a. Include a section on training. Section 3.3.5, "Other," is not adequate.

b. State the policy and plans for training of new and old employees in those areas related to safety. Indicate the steps that will be taken to assure management that operational health physicists

and nuclear safety personnel understand the safety requirements for their work assignment. The formal training should be received before the personnel are authorized to perform their assignments unattended by qualified or trained personnel. Specify the minimum required training program for each classification of personnel. Include in your license specification section the training program referenced in Section 1.3.2 of your demonstration section.

c. Confirm the training includes all the subjects listed in the October 1980 draft guide of the "Standard Format and Content" that apply to your operations.

d. Confirm the training includes ALARA practices.

e. Confirm the training includes an introduction to 10 CFR Parts 19 and 20.

f. Confirm all personnel receive additional training before changes are implemented in processes as well as in nuclear and radiation safety limits, emergency plans, or in fire protection.

g. Define the method for evaluating the understanding of the employees in safety areas (e.g., testing).

h. Confirm records of the training will be kept that include the date held, subject matter covered, attendees, instructor, test results, etc.

i. Confirm the trainees shall satisfactorily complete the tests before being allowed to handle radioactive material without direct supervision.

j. Specify the training received by both the health physics and nuclear safety technicians.

k. Confirm there is an annual retraining program with no more than 13 months since the previous training or provide justification for an alternate periodicity to assure annual retraining.

l. Describe the training program.

m. Confirm records of the retraining are also kept and include an evaluation of the retraining program.

9. Page II 3-8, Section 3.6.1

a. Confirm a health physics audit of the activities involving materials subject to the license is made at least quarterly by a member of Health Physics who meets the minimum qualifications of the Manager, Health Physics, to determine they are evaluated in accordance with applicable regulations, license conditions, licensee's policy, and written procedures. If the auditor has lesser qualifications, please specify and provide justification for their adequacy.

b. Confirm a nuclear safety audit of the activities involving materials subject to the license is made at least quarterly by a member of Nuclear Safety who meets the minimum qualifications of the Manager, Nuclear Safety, to determine they are conducted in accordance with applicable regulations, license conditions, licensee's policy, and written procedures. If the auditor has lesser qualifications, please specify and provide justification for their adequacy.

c. Confirm all audits are performed according to a written plan.

d. Confirm the audits include radiation protection, nuclear criticality safety, fire protection and environmental protection.

e. Confirm there are no more than 14 weeks between quarterly audits or provide justification for an alternate periodicity to assure a quarterly audit.

f. Confirm the minimum distribution of the audit reports specified in the above includes those listed in your section 3.6.1.

g. Show who has responsibility for followup of audit findings. Include the followup procedure that will be used, if necessary, to ensure that corrective action is taken . The audit and inspection reports should include recommendations for corrective actions and all such action already taken on recommendations resulting from the previous audit or a prior inspection.

10. Page II 3-9, Section 3.6.2

a. Confirm there are no more than 13 months between the annual audits performed by the CRSC, or provide justification for an alternate periodicity to assure an annual audit.

b. Confirm the audits are conducted to determine if plant operations are conducted in accordance with applicable regulations, license conditions, licensee's policy, and written procedures.

c. Confirm the audits are performed according to a written plan.

d. The distribution for the CRSC audit report should include the management level higher than the Director, NMCD, to whom the CRSC reports (e.g., President and/or appropriate Executive Vice President of the GAC).

e. Specify that the responsibility for followup shall be assigned. Specify the followup inspection that will be made, if necessary, to ensure that corrective action was taken.

f. Confirm the audit report includes recommendations for corrective actions and all such action already taken on recommendations resulting from the previous audit.

g. Identify who performs the functions of an ALARA Committee.

Confirm the ALARA committee shall make an annual report to senior management as an ALARA committee reviewing employee exposures and effluent release data to determine (1) if there are any upward trends developing in personnel exposures for identifiable categories of workers, types of operation, or effluent releases, (2) if exposures and release might be lowered in accordance with the ALARA concept, and (3) if equipment for effluent and exposure control is being properly used, maintained, and inspected. This report should include reviews of other required audits and inspections performed since the last ALARA review. Include frequency of meetings and membership (and qualifications) of the ALARA committee.

11. Page II 3-9

a. Confirm the licensee shall investigate and report any unusual events that significantly threaten or lessen the effectiveness of the health provisions of the license to the Executive Vice President responsible for the CRSC. The NRC shall be notified of such occurrences. Indicate the person(s) responsible for

conducting the investigation and documentation of these events, and relate this to the organizational responsibilities.

b. Describe the system for maintaining records relating to health and safety and their retention times. Include plant alterations or additions, abnormal and off-normal occurrences and events associated with radioactivity releases, criticality analyses, audits and inspections, instrument calibration, ALARA findings, employee training and retraining, personnel exposures, routine radiation surveys, and environmental surveys.

c. Confirm the criticality analyses and evaluations are maintained for at least six months after the completion or termination of the subject operation.

d. Confirm all other records are maintained for at least two years or longer if required by the regulations or other license conditions.

12. Page II 4-4, Section 4.1.3

Please present minimum acceptable criteria, including numerical standards for the initiation, selection (in vivo, urinalysis), frequency, and interpretation of results (with action levels and actions) for the bioassay program.

(The criteria presented in Regulatory Guide 8.11 are acceptable, deviations shall be justified.)

13. Page II 4-5, Section 4.1.4.1

Confirm the frequency of surface contamination surveys in the lunchroom shall be daily. Please justify any deviation.

Confirm the action level for removable contamination in the uncontrolled area shall be 200 dpm/100 cm^2. In addition, the action level in the controlled area shall be 5,000 dpm/100 cm^2. Deviations must be justified. See Reg. Guide 8.24 for additional information.

Specify within what period of time decontamination shall commence. How soon does Health Physics respond to a contamination report for cleanup?

14. Page II, 4-6, Section 4.1.4.2

Confirm that air sampler placement shall be representative of the workers' breathing zone.

Confirm that any one sampler measuring $\geq$ 1 MPC shall be reported to the Health Physics supervision and investigated and, if applicable, corrective action shall be taken.

Confirm that sampling filters shall be collected and analyzed after each shift. Confirm that a representative group of samplers shall be analyzed for the last shift prior to weekend or holiday shutdown.

15. Page II 4-17, Section 4.2.3.1

Confirm that hoods used in operations which involve dispersible material shall be operated with an average face velocity of 150 LFM.

Confirm that the face velocity of hoods shall be surveyed monthly to determine adequacy. Deviations from this frequency shall be justified.

Confirm that work shall be terminated if the average hood face velocity falls below 100 LFM (see Reg. Guide 8.24).

16. Pages II 4-7, -11, Sections 4.1.4.3, 4.1.7.2

Clarify the descriptions and criteria for treatment of liquid waste effluent. Specify whether the "effluent waste stream" collected in the holdup tank is operational waste or cleanup waste, or is all the sewage routed through the holdup tanks? State the levels of concentration that require recording, investigation and/or intervention. Confirm that agitation or other means are used to prevent accumulation of radioactive material in the bottom of the tank.

Clarify the difference between liquid waste which is released as effluent into the sewage system and liquid waste which is reduced by solar evaporation and is subsequently packaged. In a demonstration section, please provide data describing the identity, concentration, and quantity of radionuclides which have been released over the last several years of this license.

Please provide the basis in a demonstration section for the statement that "safety is due to using coated particles - each particle is a total containment system - release of radioactive material is improbable." State whether the coated particles are dispersible, are of respirable size, and whether the coating is insoluble (i.e., immersed in body fluid such as that in the lung).

17. Page II 4-18, Section 4.2.3.3

Confirm that gloveboxes and inert gas boxes shall be surveyed for the maintenance of negative pressure monthly (see Reg. Guide 8.24).

Confirm that the ventilation system shall be maintained to confine hazardous material, and

a. That pressure differentials shall be maintained for the air flow to be from zones of lesser contamination potential to zones of greater contamination potential.

b. That air sampling is conducted to confirm the adequacy of the ventilation system.

c. That effluent shall be monitored after filtering before recirculation or release.

d. That criticality and air monitoring alarms are tested monthly.

Confirm that during operations continuous air sampling is conducted in work areas where dispersible material or airborne radioactivity is possible.

18. Add the following to your Radiological Safety Demonstration Section:

a. A layout of the facility where air monitoring (fixed air) samplers are placed; indicate the area over which samplers are averaged. Include information about the number of samplers in each averaging process.

b. A table showing concentrations by area on a quarterly basis over the past two years. Show the concentrations in %MPC.

c. Internal dose assessment data in respect to operational areas.

d. A demonstration of your method of determining placement of fixed samplers to assure representativeness.

e. A discussion of how the criteria in the license conditions section are being met (e.g., determining the air sampler locations provide a representative sampling of the air being

breathed by workers handling unclad radioactive materials) and the bases for statements and assumptions affecting the evaluation of the safety of the workers.

19. Page II 5-1. Confirm there is no more than one individual responsible for custody and control of the fissile material inventory allowable in a single criticality area.

20. Page II 5-2

    a. Confirm the accident assumed requires at least two unlikely, independent and concurrent changes in process conditions before a criticality accident is possible.

    b. Add ever-safe mass and dimension limits to your definitions (Section 5.2).

21. Page II 5-3, Section 5.2

    Confirm the presence of neutron-absorbing poisons shall not be considered if their absence is credible.

22. Page II 5-3

    Provide the requirement for and approval of "posting the limits" at each location where fissile material is handled, processed, transported, or stored. Include the information required for labeling fissile material containers.

23. Page II 5-4 to -6, Section 5.4

    Specify the method for determining the applicability and accuracy of the references to your plant nuclear criticality safety. Transfer

the references to the appropriate demonstration section of the license.

24. Page II 5-7, d

    a. Provision should be made for double batching. Where double batching is not credible, provision should be made for the largest batch size possible in the container geometry at the station.

    b. Revise the criteria for maximum safe batch limits when double batching is not credible. The safe limits indicated in Table II 5.4-1 may have a safety factor as low as 1.03 (see NUREG/CR-0095).

25. Page II 5-8 and -9. Confirm the safety factors and margins are based on critical parameters after the calculational imprecisions in geometrical dimensions, uncertainties in the experimental data upon which the criteria are based and in the validation of the methods of analyses used, and possible credible accidental changes are taken into account. (See the maximum subcritical limits summarized in NUREG/CR-0095.) Justify the minimum critical limits provided in your Table II 5.4-1.

26. Page II 5-9.

    a. Confirm that, when optimum moderation and reflection are not considered credible, the justification for the assumption will be documented. Specify the criteria for allowing moderation control and for equivalent reflector thickness control. Specify the criteria for calculating the equivalent reflector thickness and illustrate its application in a demonstration section of the license application.

b. Confirm the Δk uncertainty includes the uncertainties in the experiments, uncertainties due to the limited number of validation calculations, and uncertainties in the extrapolation from experiment to plant conditions.

c. Justify the use of $k_{eff} \leq 0.97$ as safe (see Y-1858, "Validation checks of the ANISN and KENO Codes by correlation with Experimental Data" dated November 20, 1972). A $k_{eff} + 2\sigma \leq 0.95$ would be acceptable (considering the bias in the validation calculations). You indicate on page I 5-30 uncertainties in reading the critical volumes may be ± 3% k. The uncertainty may also be applied to reading data from plots of other critical parameters. You also show greater than 2% error in one of your validation calculations summarized on page I 5-31.

d. Confirm the statistical uncertainties in the calculated value are at the 99% confidence level.

e. Provide justification for basing the safe geometries on a hand calculated k_{eff} of 0.90.

f. Confirm the array of SNM in shipping containers is isolated from other arrays.

27. Page II 5-11, Section 5.4

a. Confirm "overbatching" is considered credible if a partial second batch may be accidentally added.

b. Clarify the "difficulties" of adding a second batch.

28. Page II 5-11

a. Confirm the concrete thicknesses required for isolation between two arrays are based on the k_{eff} of a fully water-reflected station unit or provide justification if the isolation thickness is based on the k_{eff} of a bare station unit.

29. Page II 5-12.

a. Provide justification for the criteria to be used in 3.a.

b. Confirm the plane array specified in item 3.b. is a single-plane array.

30. Pages II 5-13 and -14

a. Provide justification for the limits on the units in Table II 5.5-1 for the 16 inches center-to-center spacing. Independent calculations indicate the k_{eff} of an infinite single-plane array of 3.8 liter units (compared to 3.6 liter units in the table) is 1.016 ± .005 and 0.941 ± .006 containing 3.6 and 1.2 kg ^{235}U, respectively.

b. Confirm the limits apply only to single-plane arrays. Sections 5.5.7 and 5.5.8 of Part I indicate they may be used for 3-dimensional arrays.

c. Demonstrate the application of criterion 3.c.

d. Provide justification for the use of the solid angle method for array analysis for each type system (other than solutions) in which it is to be used.

(1) Application of the method to small numbers of closely spaced units characterized by a fast neutron spectrum can result in non-conservative spacing (see NUREG/CR-0095, Nuclear Safety Guide).

(2) Provide justification for the separation of only 8 inches between units in which there can be no interspersed moderation.

(3) Confirm "shadowing" is negiected in determining the solid angle between all units in an array.

(4) Provide criteria for the application of the surface density method of array analysis.

31. Pages II 5-14, and -15, Section 5.6

a. Specify the review and approval requirements that confirm the structural integrity of safety-related structures, systems, and components.

b. Provide the criteria used in the choice of fire protection methods.

c. Confirm the absorbers in solutions used are fixed insoluble absorbers.

d. Specify the criteria for testing and inspection of the neutron absorbers in solutions when they are not borosilicate-glass raschig rings. Confirm that alternate poison material shall be used only after justification for its use is provided and NRC approval is obtained. Visual inspections are not adequate to determine the presence of a poison that meets design criteria.

The use of soluble poisons as primary nuclear criticality safety controls requires further justification.

e. Update the NRC Regulatory Guide reference for the use of borosilicate-glass raschig rings (Revision 1, January 1982).

32. Pages II 5-15 and -16, Section 5.7

a. Clarify the responsibility of the operating departments for the analysis and documentation of the detailed nuclear safety analysis of any activity initiated under the license. This appears to be the responsbility of the Nuclear Safety function within the Nuclear Materials Control Division (NMCD).

b. Provide the criteria to be used in the validation of calculational methods (see Regulatory Guide 3.41, "Validation of Calculational Methods for Nuclear Criticality Safety," Revision 1, May 1977).

c. Clarify the demonstration of "good agreement" with experimental results prior to their approval for use in making detailed criticality calculations. Specify the criteria and the method in which they are to be used. How are their "adequacy" and "reliability" determined?

d. Confirm there is "satisfactory two level review" and documentation of all calculations (computer or hand calculations) made to establish the nuclear safety of fuel handling and storage activities and safety-related equipment and facilities.

33. Page II 5-17, Section 5.8

Clarify the need for analysis of large, dilute carbon systems when the ^{235}U mass density is <0.02 kg/liter but not when ≥0.02 kg/liter.

34. Page II 5-18

Justify the elimination of the requirement for posting of limits when ≤350g ^{235}U, ≤250g ^{233}U, or 220g Pu are used or stored or confirm all areas are posted.

35. Page II Section 6

a. Confirm corrective action will be taken whenever quarterly gaseous effluent releases are ≥ 25% of the unrestricted area MPC identified in 10 CFR 20, Appendix B, Table II.

b. State the sampling method, frequency, radioactivity analysis, and action prior to discharge of all radioactive waste streams and process cooling water.

c. State the sampling method, its frequency (or whether it is continuous), analysis method, action levels and action, lower limits of detection, calibration and standardization of measurements, method of reporting, and responsibility for action taken for all gaseous effluents at their point of discharge.

d. Identify the means for the disposal of all solid contaminated equipment and materials.

e. Designate the positions having responsibility for effluent control and monitoring to ensure compliance with all applicable standards, rules, and license conditions.

36. Pages II 6-3 and -4

a. Provide the radiological environmental monitoring program (which includes air and fallout sampling) for evaluating the airborne radioactivity.

b. State the methods (e.g., thermoluminescent dosimetry) for determining ambient radiation levels for both onsite and offsite locations.

c. Provide the soil, vegetation, and surface and underground water sampling program.

d. Identify the location of the sampling stations, including the background location.

e. Specify the procedures for evaluating and reporting results of the monitoring program.

f. Clarify the meaning of "sampling stations which show statistically significant results" and identify the position responsible for determining sampling station site deletions.

g. Confirm the non-radiological monitoring program shall meet State and Federal EPA requirements.

37. Page II 7-1 Section 7.1

Confirm GAC has no packaging and shipping requirements that must meet the requirements of 49 CFR Parts 171 and 172.

38. Page II 8-1

Confirm your site-wide emergency preparedness plan will be submitted for review and approval by November 3, 1982.

39. Page II 8-2, Decommissioning Plan

a. Include your decommissioning plan in the renewal application.

b. Include the criteria for releasing equipment for unrestricted use in estimating the cost of decommissioning.

General Comments

1. The "to be" in the specification section should be changed to "shall," a requirement (e.g., page II 3-9, Audits shall be performed by the CRSC, "Procedures shall be required for all activities").

2. Revise the application to reflect the reorganization of your safety and license related activities.

a. Incorporate the comments in your submittal dated July 24, 1981 that apply to your new organization.

b. Which function performs the nuclear safety activities (e.g., procedure review, nuclear safety analyses, inspections and audits, and training)?

c. Identify the supervisory responsibility for the nuclear safety function.

II. DEMONSTRATION SECTIONS

1. Page I 1-1

   Update the ownership of the General Atomic Corporation.

2. Page I 3-3. Locate and identify the "B" operations on the flow diagram (Figure I 3.1-1) and on the layout (Figures I 3.1-2, first and second levels) with appropriate limits.

3. Pages I 3-8, -9 and Page I 3-40. Explain the lack of minimum surface-to-surface separation vertically between storage containers.

4. Page I 3-9. Confirm that 12-inch-thick partitions do not provide isolation between bays.

5. Page I 3-13

   a. Confirm the referenced uranium concentration is 400g/liter.

   b. Confirm the Type C units have a base k_{eff} of 0.58 and the maximum solid angle allowable would be 3.2 steradians.

6. Page I 3-14

   Locate Reference 3.1-1.

7. Page I 3-24

   Contrary to the statement made regarding concrete isolation, Table 3.1-5B indicates the isolation thickness may be >16 inches.

8. Figure I 3.1-7

Confirm the system represented consists of four rows of fissile storage arrays (see p. I 3-24).

9. Page I 3-25

a. Identify the aisles on Figure I 3.1-7 that were changed to 30 and to 36 inches.

b. Describe the modelling of the concrete walls as 7½" thick with the 8" shown on Figure I 3.1-7.

c. Confirm there are arrays of one gallon containers on either side of the concrete walls.

10. Page I 3-26

Check license conditions for maximum allowable k_{eff}.

11. Page I 3-34, Section 3.14.4.3

Clarify the statement there is no source of water present (e.g., in the room, at the station, etc.).

12. Page I 3-43

Reconcile the maximum safe mass of 350g ^{235}U in Figure I, 5.4-1 with the 740g ^{235}U in the feed hopper.

13. Page I 3-43

Correct the reference to Part II, Section 7.4, item 3b.

14. Page I 3-44, Section 3.1.4.4.15

Provide a figure showing the relationship between H/U and the kg ^{235}U/liter so that Figure I 5.4-1 can be used to determine the maximum safe batch size.

15. Page I 3-50 and -51

Specify the controls that limit the hopper to 4.8 kg ^{235}U and the Type B containers to 3.6 kg ^{235}U.

16. Page I 3-55

Reconcile the 160 ppm H in the coolant with 0.6% H in the fuel and the corresponding 185 ppm H in Figure I 3.1-11.

17. Page I 3-57

a. Explain why double batching (740 or 783 g ^{235}U) is not credible.

b. Specify the location of Table II 7.4-1.

c. Reconcile the coater limit of 740 g ^{235}U with the 4.8 kg ^{235}U limit indicated on page I 3-54.

18. Page I 3-99g, Section 3.1.7.6.4. Provide justification for neglecting the shadowed units in an array when calculating the solid angle of an array from any one unit in the array (see NUREG/CR-1615, "Solid Angle and Surface Density as Critical Parameters," by J. T. Thomas, dated October 1980).

19. Pages I 3-99d, e, f, g, m, n. Justify the use of the dump system for waste solutions when it is possible to erroneously dump concentrated ^{235}U solutions (stored at the same storage station in the

same size containers) into the non-safe geometry funnel and into the 55-gallon containers.

20. Figure I 3.1-6

Provide justification for the "dashed" curve.

21. Page I 3-102, Section 3.3.1

Provide the layout of the Central Storage Facility showing the division into a drum storage and vault-type storage room.

22. Page I 3-103, Section 3.3.1.1. Confirm the 12-inch-thick concrete walls are only considered isolation between arrays of cylindrical or spherical units (not slabs, see p. I 3-23).

23. Pages I 3-130, -132

a. Describe the controls used to prevent double batching.

b. Specify the form and composition of the material in the four laboratory classes.

24. Figure I 3.4-1

Specify the minimum air gap and gypsum board thickness between batches.

25. Page I 3-141

Identify footnote 2 in Table I 3.5-1.

26. Page I 3-166

Demonstrate that homogenization of the array of 1.5-inch-diameter cylinders on 6 inch centers is conservative for calculating the k_{eff} of an array of flooded cylinders.

27. Page I 3-167

Justify the use of the solid angle method when units in the array have an edge-to-edge separation of less than 12 inches.

28. Page I 3-175

Provide justification for the use of the solid angle method of analysis to (for small numbers of closely spaced) units characterized by a fast neutron spectrum. The method can result in non-conservative spacing (J. S. Tang, "Investigation of the Solid Angle Method Applied to Reflected Cubic Arrays," ORNL/CSD/TM-13, dated October 1976, and "Nuclear Safety Guide TID-7016, Revision 2, NUREG/CR-0095, dated June 1978).

29. Page I-178

a. Confirm the limits of error are considered in determining the safety factor required in establishing allowable mass or geometry limits (e.g., compare criticality limits in the AHSB Handbook with those in TID-7028 and with the maximum subcritical limits in the N16.1 Standard). However, there is no question on the safety of the 1.6 kg ^{235}U batch size.

b. The criticality limits in the referenced data are based on water-uranium metal mixtures. Confirm their application to uranium alloy-water mixture data, based on g ^{235}U/cc

concentrations, are conservative (e.g., the relationship between the g ^{235}U/cc and H/U ratio differs for the two systems).

30. Pages I 3-181 and -185

Specify the maximum quantity of ^{235}U chips and related container geometries allowed at the machining stations.

31. Page I 5-7

Confirm "published" criticality data will not be used unless their validity and applicability are established.

32. Page I 5-10

Provide the basis for adding the reflector savings to the extrapolation length term in determining the appropriate height term in the extrapolation length for a parallelepiped.

33. Page I 5-11

Provide justification for the small 3% safety margin in the calculation of the allowable k_{eff} based on possible errors in "reading" the criticality data and lack of benchmark data defining the experiment.

34. Page I 5-21

Reconcile the statement on the "conservatism" of the solid angle method with its non-conservatism claimed in NUREG/CR-0095 and in ORNL/CSD/TM-13.

35. Page I 5-21. Reconcile your "neglect" of shadowing with the requirement that the solid angle subtended with all units in the array be considered (see NUREG/CR-1615, "Solid Angle and Surface Density as Critical Parameters", dated October 1980).

36. Page I 5-23

    a. Clarify the dimensions of the "rectangle" (e.g., 2A and 2A and 2B).

    b. Provide sketches for each geometry used and identify the nomenclature with those in the formulations for the solid angle calculations.

37. Page I 5-35

    Locate Figure I 5.3-1.

38. Page I 5-45

    Explain the large differences in calculated k_{eff}'s using KENO IV, KENO II and DTFX. The conclusion reached in Section 5.3.4.4 indicates agreement between the calculated results using the different methods.

39. Page I 5-50

    a. Clarify the statement on agreement between TID-7028 and the detailed computer calculations "demonstrated in Table I 5.3-2."

    b. Justify the selection of Reference 5.3-15 over Reference 5.3-16 based on "reliability." Although consideration for the uncertainties in the experimental data is taken into account in establishing the safe parameters (by application of appropriate

safety factors) in the former reference, there are uncertainties in reading the figures accurately. The latter reference provides maximum subcritical limits (after removal of all uncertainties from the criticality data) and plots the data on figures that can be read more accurately. Greater safety margins are given in some ranges of fissile concentration than over others because of the differences in uncertainties in some concentration ranges and the desire to establish safe parameters over the entire concentration range.

c. The referenced TID-7028 slab data used to determine the minimum critical surface densities are based on estimated thicknesses of infinite critical slabs. Figure I.5.4-6, having a "safety factor" of 2.3, may be adequate if the surface density to be used is always based on the minimum at optimum moderation. Use of the figure at any other degree of moderation should be justified.

40. Pages I 5-53, -54

a. Revise the safety margins to be consistent with those in the license conditions section.

b. Caution should be exercised in the use of the critical parameters in TID-7028 in order to be sure the parameters are conservatively read (e.g., an independent calculation of the minimum critical concentration in a 5-inch diameter by 30-inch tall cylinder indicates the minimum critical concentration to be 2.60 kg ^{235}U/liter vs. 2.85 kg/liter based on GAC Figure I 5.4-12; for a 5.5-inch diameter by 30-inch tall cylinder, independent calculations indicate a critical concentration 95% of that calculated by GAC).

41. Page I 5-56, Section 5.5.1

Include reference 5.5-1 on page I 5-88.

42. Page I 5-57

Confirm your "gallon containers" are no larger than 3.8 liters.

43. Page I 5-61

Provide a step-by-step derivation of the formula specified.

44. Page I 5-64

Define σ and show how it was derived from page 19 of reference 5.5-3.

45. Page I 5-67 and -68

Confirm the safety factor for the 2.4-liter volume of plutonium and the 1.3-liter volume of ^{233}U is 1.33.

46. Page I 5-75

Provide Figure I 5.5-6 that contains "a diagram of the barrel and fuel body." The figure provided relates to the k_{eff} of concrete reflected arrays.

47. Page I 5-76

Include Figure I 5.5-7 in the application.

48. Page I 5-77

a. Provide justification for the mass and spacing limits for the Type G array. Independent calculations indicate a k_{eff} of 1.016 ± .005 for single-plane arrays of spheres on 16-inch centers.

b. Confirm "Standard Limit Type G" applies only to single-plane arrays. For additional comments see those made related to Table II 5.5-1, page II 5-13.

49. Page I 5-78

a. Clarify the statement that "no vertical separation is required" between 16-inch tall one-gallon cylinders (4.30-inch diameter) in an array. Also clarify the comparison of these cylinders with an array of 17.5 cm (6.89-inch) diameter cylinders. The arrays considered for Type G containers are all planar.

b. Clarify the relationship between the 17.5 cm diameter cylinders and the one gallon cylinders having a 16-inch height (diameter of 10.9 cm).

50. Page I 5-80

Confirm Figure I 5.5-6 should be identified as Figure I 5.5-8 (referenced in the text).

51. Page I 5-82

Confirm the plane arrays for "Standard Type H" apply only to single-plane arrays.

52. Page I 5-83

Confirm the Type G containers are used only in single-planar arrays (see item #46 above).

53. Page I 5-88

Identify the amendment referenced by number and date.